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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	09/994,075
Filing Date	11/27/2001
First Named Inventor	HUA, Xujun
Group Art Unit	1731
Examiner Name	Marc S. Alvo
Total Number of Pages in This Submission: 75	Attorney Docket Number: 10326-54US-1 KPM/ec

ENCLOSURES *(check all that apply)*

- [x] Fee Transmittal Form
  - [x] Fee Attached
- [ ] Amendment / Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
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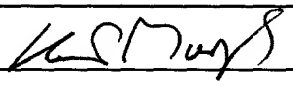
- [ ] Proprietary Information
- [ ] Status Letter
- [ ] Other Enclosure(s) *(please identify below)*:

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Kevin P. Murphy (Regis. No. 26,674)
Signature	
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TOTAL AMOUNT OF PAYMENT	($) 160.00

Complete if Known	
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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	
				SUBTOTAL (1) ($)	

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

			Extra Claims		Fee from below		Fee Paid
Total Claims		- 20**=		X		=	
Independent Claims		- 3**=		X		=	
Multiple Dependent						=	

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Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent
				SUBTOTAL (2) ($)

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FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,970	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	160
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Petitions related to provisional applications	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection(37 CFR § 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	
Other fee (specify)					

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SUBTOTAL (3) ($) 160

SUBMITTED BY				Complete *(if applicable)*	
Name *(Print/Type)*	Kevin P. Murphy	Registration No. *(Attorney/Agent)*	26,674	Telephone	(514) 847-4293
Signature				Date	June 20, 2003

[SOR.PAT.FORM 108 – 10/2001]

PTO/SB/17 (01-03)
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First Named Inventor	HUA, Xujun
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FEE CALCULATION (continued)

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Other fee (specify)					

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SUBTOTAL (3) ($) 160

SUBMITTED BY				Complete *(if applicable)*	
Name *(Print/Type)*	Kevin P. Murphy	Registration No. *(Attorney/Agent)*	26,674	Telephone	(514) 847-4293
Signature				Date	June 20, 2003

2402

File No. 10326-54US-1 KPM/ec

Montreal, Canada
June 20, 2003

BEFORE THE UNITED STATES PATENT AND TRADEMARKS OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellants:	XUJUN HUA ET AL
Serial No.:	09/994,075
Filed:	November 27, 2001
For:	METHOD FOR REDUCING ALKALINE DARKENING OF MECHANICAL PULP CONTAINING A CALCIUM CARBONATE FILLER
Art Unit:	1731
Examiner:	Marc S. Alvo

Commissioner for Patents
P. O. Box 1450
Alexandria, Virginia 22313-1450
U. S. A.

APPEAL BRIEF

Sir:

This is an Appeal from the Decision of the Examiner in Art Unit 1731, finally rejecting claims 1 to 12 and 20 and 25. The Notice of Appeal was filed April 25, 2003.

REAL PARTY IN INTEREST

The real party of interest in this Appeal is the Assignee, Pulp and Paper Research Institute of Canada, the owner by Assignment recorded on November 27, 2001 on Reel/Frame 012329/0894.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF THE CLAIMS

The claims pending in the above-identified U. S. Patent Application are claims 1 to 12 and 20 to 25.

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Claims 13 to 19 were cancelled previously, without prejudice, following an election requirement.

STATUS OF AMENDMENTS

No amendment has been made in response to the Final Action of February 4, 2003 (Paper No. 5).

The claims on appeal are claims 1 to 12 and 20 to 25.

PRIOR ART RELIED UPON BY THE EXAMINER

US-4,427,490	01-1984	Eckert, Robert C.	
US-5,882,476	03-1999	Evans et al	
US-4,183,146	01-1980	Tsukamoto et al	
US-H0,001,690	11-1997	Nye, Jeffrey	
US-2,173,167	09-1939	Hovey, Rexford	
96/20308	07-1996	WO	Minerals Tech.
0 608 687	07-1994	EP	BASF

So-called ADMITTED PRIOR ART (specification, page 2, lines 13 to 21).

REJECTIONS

In the Final Action, claims 1 to 7, 10, 11, and 20 to 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 96/20308 in view of Eckert or Evans et al.

Claim 8 is rejected under 35 U.S.C. 103(a) over WO 96/20308 in view of Eckert or Evans et al as applied to claim 1, and further in view of Tsukamoto et al.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO 96/20308 in view of Eckert or Evans et al as applied to claim 1, and further in view of Nye or EP 0 608 687.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO 96/20308 in view of Eckert or Evans et al as applied to claim 1, and further in view of ADMITTED PRIOR ART (specification, page 2, lines 13-21).

Claims 1 to 8, 10, and 20 to 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hovey in view of Tsukamoto et al.

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Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hovey in view of Tsukamoto et al as applied to claim 1, and further in view of Nye or EP 0 608 687.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hovey in view of Tsukamoto et al as applied to claim 1, and further in view of ADMITTED PRIOR ART (specification, page 2, lines 13-21).

These are the only outstanding rejections in this case.

SUMMARY OF THE INVENTION

The invention claims a method of inhibiting darkening, more especially alkaline darkening, of a mechanical pulp in the presence of calcium carbonate as well as a method of producing paper employing such method. Calcium carbonate is typically employed as a filler in pulp in paper manufacture.

The invention is based on the finding that the alkaline darkening of a mechanical pulp in the presence of calcium carbonate filler, is inhibited by incorporating a sulphite in the pulp suspension of the mechanical pulp.

Independent claim 1 requires:

providing an aqueous suspension of a mechanical pulp for producing paper, and

incorporating in the suspension a calcium carbonate filler for producing paper with the pulp, and a sulphite to inhibit alkaline darkening of the pulp in the suspension, arising from the calcium carbonate filler in the suspension.

Independent claim 20 requires:

providing an aqueous suspension of a mechanical pulp for producing paper,

incorporating in the suspension a calcium carbonate filler for producing paper with the pulp, and a sulphite,

maintaining a pH of 7 to 9 in the resulting suspension containing the pulp, filler and sulphite, and

chemically reacting the sulphite with the pulp to inhibit darkening of the pulp by the calcium carbonate.

Independent claim 23 is directed to a method of producing paper from a mechanical pulp and calcium carbonate filler employing the method of the invention with the additional step of forming the suspension into paper.

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The dependent claims recite particular and preferred parameters, such as preferred sulphites, preferred pH ranges, preferred sequences for the point of addition of the sulphite and inclusion of additives, such as buffers, acids and chelating agents.

The examples of the specification clearly demonstrate the effect of sulphite in inhibiting darkening of the pulp in the alkaline environment resulting from the presence of the calcium filler.

Inhibition of darkening as in the present invention is different from, and should not be confused with, brightening or bleaching of pulp. Inhibition of darkening, on the one hand, and brightening or bleaching of pulp, on the other, are distinctly different concepts and chemical procedures.

ISSUES

Based on the plurality of grounds of rejection, there are seven issues presented by this Appeal, these being set out as follows:

A. Did the Examiner err in rejecting claims 1 to 7, 10, 11, and 20 to 25 under 35 U.S.C. 103(a) as being unpatentable over WO 96/20308 in view of Eckert or Evans et al?

B. Did the Examiner err in rejecting claim 8 under 35 U.S.C. 103(a) as being unpatentable over WO 96/20308 in view of Eckert or Evans et al and further in view of Tsukamoto et al?

C. Did the Examiner err in rejecting claim 9 under 35 U.S.C. 103(a) as being unpatentable over WO 96/20308 in view of Eckert or Evans et al and further in view of Nye or EP 0 608 687?

D. Did the Examiner err in rejecting claim 12 under 35 U.S.C. 103(a) as being unpatentable over WO 96/20308 in view of Eckert or Evans et al and further in view of ADMITTED PRIOR ART (specification page 2, lines 13-21)?

E. Did the Examiner err in rejecting claims 1 to 8, 10, and 20 to 25 under 35 U.S.C. 103(a) as being unpatentable over Hovey in view of Tsukamoto et al?

F. Did the Examiner err in rejecting claim 9 under 35 U.S.C. 103(a) as being unpatentable over Hovey in view of Tsukamoto et al and further in view of Nye or EP 0 608 687?

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G. Did the Examiner err in rejecting claim 12 under 35 U.S.C. 103(a) as being unpatentable over Hovey in view of Tsukamoto et al and further in view of ADMITTED PRIOR ART (specification, page 2, lines 13-21)?

GROUPING OF THE CLAIMS

The claims under consideration, claims 1 to 12 and 20 to 25, are separately patentable.

THE REFERENCES

There are two distinct lines of rejection. The first relies on WO 96/20308 as the principal reference, and the second relies on Hovey as the principal reference.

a) WO 96/20308

WO 96/20308 is clearly concerned with **bleaching** of filled paper, more especially, a paper that has been darkened **previously** due to calcium carbonate (see page 2, lines 17 to 26 of WO 96/20308). In WO 96/20308, the bleaching chemical does **not stop** the production of chromophores (i.e., does not inhibit darkening), but rather removes the chromophores **already produced** by darkening.

This is completely different from the present invention, and to appreciate this, it is necessary to understand the difference between inhibition of alkaline darkening and bleaching or brightening.

Bleaching or brightening involves the chemical elimination of existing chromophores in a pulp in order to obtain an increase in brightness. **In contrast,** inhibition or prevention of darkening stops or reduces the production of **new chromophores** such as those induced by alkalinity. In other words, inhibition prevents or reduces a drop in the original brightness of the pulp, but does not cause an increase in the brightness of the original pulp, while bleaching (or brightening) serves to obtain a **higher** brightness than that of the original pulp.

Example V and Table 3 in the specification serve to illustrate the difference between the darkening inhibition in accordance with the invention and bleaching or brightening as in the prior art.

In the procedure of Example V, pulp with or without darkening inhibition using sulphite, was bleached subsequently with hydrosulphite.

Before using the technology of the invention (darkening inhibition), the brightness of the pulp was lowered by 2 to 3 points due to alkaline darkening caused

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by the calcium carbonate filler. **This brightness loss could not be regained by the subsequent bleaching stage.**

By adding sulphite before darkening occurred, in accordance with the invention, **the alkaline darkening was inhibited**, and because of this inhibition, **the pulp maintained its brightness** as if the pulp had been in an acid medium. The subsequent bleaching was then able to **further improve the brightness** to the target level.

In the light of the foregoing, it should be evident that the principal reference WO 96/20308 is irrelevant to inhibition of alkaline darkening, which is what the present invention is concerned with.

b) U. S. Patent 2,173,167, Hovey

Hovey is concerned with paper manufacture and the use of calcium carbonate as a filler.

Hovey recognizes the problem of alkaline darkening caused by the alkalinity of the calcium carbonate. Hovey seeks to overcome this problem by employing HIGH LOADINGS of the calcium carbonate filler. The brightening achieved by Hovey results not from inhibition of the alkaline darkening but by masking the darkened pulp with the higher loading of calcium carbonate filler which more especially is white. Hovey expressly indicates that:

> "In my method the brightening effect of the carbonate filler is more of a mechanical one as the discoloring substance is formed in the paper due to alkalinity and heat drying is permitted to remain in the paper without alteration to increase its opacity, as above stated, **and the solid particles of carbonate mechanically cover up or obscure the discoloring substance** and the original dull or dark color of the groundwood."

Hovey clearly does **not** teach that calcium carbonate filler inhibits alkaline darkening of pulp. On the contrary, Hovey quite clearly teaches that the alkalinity of the carbonate filler causes an additional discoloration of groundwood (page 2, left-hand column, lines 27 to 33).

The assessment in the Final Action and in the earlier prosecution of this application that Hovey teaches that the calcium carbonate filler can **offset** the calcium carbonate darkening that occurs when lower amounts are used is totally erroneous as

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has been pointed out repeatedly. Calcium carbonate does **not** inhibit alkaline darkening, and Hovey does not teach that it does. On the contrary, it is well known and recognized by Hovey that calcium carbonate causes alkaline darkening. Hovey seeks to mechanically mask or obscure the darkened pulp with high loadings of the white filler, but the darkening still occurs. It is simply less evident because of the high loading of white filler particles.

c) U. S. Patent 4,427,490, Eckert

Eckhert is concerned with delignification and bleaching processes for lignocellulosic pulp with peroxide in the presence of metal additives.

Eckert contains no teaching whatsoever with respect to calcium carbonate fillers or the alkaline darkening which results from the inclusion of such fillers.

Eckert describes two classes of compounds generally used as lignocellulosic brighteners, and the list of such brighteners includes hydrosulphites. This has absolutely no relevance to the present invention. Nowhere in Eckert is there any teaching or suggestion that hydrosulphites or indeed any of the other chemicals described will inhibit the alkaline darkening of pulp caused by a calcium carbonate filler.

The citation of Eckert arises from the apparent misunderstanding as to the complete difference between alkaline darkening of pulp caused by calcium carbonate filler, on the one hand, and brightening or bleaching of pulp, which does not involve the presence of calcium carbonate filler, on the other.

d) U. S. Patent 5,882,476, Evans et al

Evans et al is concerned with de-inking waste paper. Evans et al teaches that caustic soda (i.e., sodium hydroxide), employed to promote ink-fiber separation, causes alkaline darkening.

Evans et al seeks to overcome this problem by **avoiding** the use of sodium hydroxide, so as to avoid the darkening problem. Evans et al employs a combination of sodium sulphite and sodium carbonate to promote ink-fiber separation and teaches that this combination does not cause the darkening.

Evans et al does not employ calcium carbonate as a filler, and is not faced with a problem of alkaline darkening resulting from calcium carbonate filler. Evans et al does not teach inhibition of alkaline darkening as a result of calcium carbonate filler

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or any other agent. Rather, Evans et al teaches to avoid darkening by avoiding the de-inking agent responsible for the darkening, i.e., caustic soda.

e) U. S. Patent 4,183,146, Tsukamoto et al

Tsukamoto et al is concerned with the use of a brightening agent to elevate the brightness of wood pulp. The brightening agent is a sulphonating compound, and such compounds are described including sulphites. Tsukamoto et al is not concerned with inhibition of alkaline darkening caused by the presence of calcium carbonate filler.

f) U. S. H0,001,690, Nye

Nye is concerned with bleaching lignocellulosic containing pulp by the sequential steps of treating the pulp with a reducing agent, a chelating agent and an oxidative agent. Nye contains no teaching relating to alkaline darkening caused by calcium carbonate filler, and no teaching relating to the inhibition of such darkening. Nye does not even contain teaching with respect to the use of calcium carbonate filler.

g) EP 0 608 687

EP 0 608 687 is similar to Nye. It describes different materials for bleaching pulp but contains no teaching with respect to the use of calcium carbonate filler in pulp, in paper manufacture, and no teaching relating to the darkening which results from the presence of such calcium carbonate filler.

h) ADMITTED PRIOR ART

The so-called ADMITTED PRIOR ART merely describes conventional conditions under which calcium carbonate is added as filler in the papermaking system.

EXAMINER'S RATIONALE

In the first principal rejection, the Examiner rejected claims 1 to 7, 10, 11, and 20 to 25 under 35 U.S.C. 103(a) as being unpatentable over WO 96/20308 in view of Eckert or Evans et al.

The Examiner indicates that the principal reference WO 96/20308 teaches inhibiting the darkening effect arising from the effect of calcium carbonate filler in mechanical pulp, by bleaching the filled mechanical pulp with a bleaching agent.

The Examiner takes the position that Eckert teaches the alternativeness of bleaching mechanical pulp with hydrosulphites and bisulphites as reducing agents that

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remove or alter the lignin in the pulp so that the resultant pulp is no longer light absorbing or dark in colour.

The Examiner takes the position that Evans et al teaches treating pulp including groundwood with sodium carbonate and sodium sulphite to prevent alkaline darkening of the pulp and reduce the need for additional bleaching.

The Examiner takes the position that it would be obvious to substitute the bisulphate of Eckert for the hydrosulphite of WO 96/20308 on the basis that they are alternative bleaching and brightening agents for mechanical pulps in preventing the darkening of the pulp.

The Examiner takes the position that it would have been obvious to one of ordinary skill to further prevent darkening of the pulp and reduce the need for further bleaching in the process of WO 96/20308 by treating the pulp with sulphite and carbonate in the manner taught by Evans et al.

In the rejection of claim 8, which is directed to the feature of establishing pH by addition of a pH buffer or an acid, the Examiner relies on the principal combination of WO 96/20308 in view of Eckert or Evans et al and further in view of Tsukamoto et al as teaching adjusting the pH during bleaching with an acid or a buffering agent. The Examiner indicates that it would have been obvious to maintain the pH in WO 96/20308 with either a buffering agent or the addition of an acid as taught by Tsukamoto et al.

In the rejection of claim 9, which recites the additional feature of adding a chelating agent, the Examiner relies on the principal combination of WO 96/20308 in view of Eckert or Evans et al and additionally in view of Nye or EP 0 608 687, and takes the position that both Nye and EP 0 608 687 teach increasing the whiteness of a bleached pulp by adding a chelating agent with a reductive bleaching agent.

In the rejection of claim 12, which is directed to the point of introduction of the sulphite, the Examiner relies on the principal combination of WO 96/20308 in view of Eckert or Evans et al in combination with the so-called ADMITTED PRIOR ART, on the basis that the addition of additives at the stock is well known based on the ADMITTED PRIOR ART and that consequently the addition of the carbonate and bleaching additives would be obvious at that point.

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In the rejection of claims 1 to 8, 10, and 20 to 25 under 35 U.S.C. 103(a) as being unpatentable over Hovey in view of Tsukamoto et al, the Examiner takes the position that Hovey teaches incorporating mechanical pulp with calcium carbonate filler to inhibit the alkaline darkening; that Tsukamoto et al teaches that mechanical pulps can have their brightness increased by sulphonation; and that it would have been obvious to one of ordinary skill that the darkening of the mechanical pulp of Hovey could be further prevented by adding a sulphonating agent during the drying stage as taught by Tsukamoto et al to brighten the pulp.

The Examiner also takes the position that it would have been especially obvious to use the sodium sulphite of Tsukamoto et al in combination with the calcium carbonate of Hovey on the basis that Tsukamoto et al teaches using sulphite in combination with calcium carbonate buffers to control pH when using a single sulphite.

The rejection of claims 9 and 12 based on the additional reliance of Nye or EP 0 608 687 and of the so-called ADMITTED PRIOR ART is based on the same rationale as indicated in the first line of rejection based on WO 96/20308 in view of Eckert or Evans et al.

The Examiner further takes the position that applicant has argued that by adding sulphite, the darkening is inhibited before bleaching, and that this would have been obvious from the teachings of Eckert.

The Examiner takes the position that the addition of sulphite to a pulp to inhibit darkening would be expected from the teachings of Eckert or Evans et al on the basis that if lignin is removed or altered to become non-light absorbing, darkening would be prevented or inhibited.

The Examiner takes the broad position that Hovey teaches that using 3 to 9% calcium carbonate filler can offset calcium carbonate darkening that occurs when lower amounts are used.

ARGUMENT

a) Rejection of claims 1 to 7, 10, 11, and 20 to 25

This rejection is based on WO 96/20308 in view of Eckert or Evans et al.

This rejection is based on an erroneous assessment of the principal reference WO 96/20308 by finding that bleaching of filled mechanical pulp with a

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bleaching agent is the same as inhibiting the alkaline darkening arising from calcium carbonate filler.

The distinction between inhibition of alkaline darkening resulting from calcium carbonate filler, and the bleaching or brightening of pulp with a bleaching agent which proceeds in a manner unrelated to the presence or absence of calcium carbonate filler, has been considered above.

This difference already discussed above is further demonstrated by Example V in the specification which shows that most alkaline darkening was inhibited by the addition of 0.5% sodium sulphite to the latency chest. In further tests, full inhibition of darkening occurred at 1% sodium sulphite, and the pulp maintained its brightness as if the pulp had been in an acid medium. A subsequent bleaching was able to further improve the brightness to 62.3%.

Appendix A, previously submitted and also attached hereto, includes additional Examples VII and VIII which further illustrate the invention and the difference between alkaline darkening inhibition, and bleaching (or brightening).

In Example VII, a TMP was treated with calcium carbonate. In the absence of sulphite, the brightness of the pulp **decreased** from 57.6 to 54.6% because of alkaline darkening. When 1% sulphite was present during the calcium carbonate treatment, the final brightness was 57.5% because sulphite inhibited alkaline darkening. However, when 1.5% sulphite was added to the alkaline-darkened pulp, the brightness increased only to 55.7% from 54.6%. Clearly, the brightness loss due to alkaline darkening **cannot** simply be regained by bleaching, even with a **higher** sulphite dosage, 1.5% in this case (as compared with 1% to inhibit alkaline darkening).

This indicates that sulphite is more efficient as a darkening inhibitor than as a brightening or bleaching agent. If sulphite functioned only as a bleaching agent to eliminate the **existing** chromophores, then one would expect that when sulphite was added to the darkened pulp, it should have **gained more** brightness because there were more chromophores there to react. However, the results showed the opposite. Therefore, bleaching (or brightening) and darkening inhibition are two completely different concepts. The function of sulphite according to the present invention is

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darkening inhibition, not bleaching or brightening, and this function of darkening inhibition is new and not suggested in the prior art.

In addition, the inventors found that even though sometimes a bleaching or brightening process may eliminate the chromophores generated by alkaline darkening, a **higher** chemical dosage was required than with inhibition of darkening. In one trial, (Example VIII), alkaline-darkening of a TMP was inhibited with 0.9% sulphite. This inhibition led to a pulp brightness of 57.2% after the subsequent bleaching stage with 0.4% hydrosulphite. When the darkening was not inhibited by sulphite, the subsequent bleaching stage required a **double** amount of hydrosulphite (0.8%) to reach the same brightness target. This again shows that the darkening inhibition of sulphite cannot be explained by its brightening effect.

Prior art relating to the use of sulphite as a brightening agent to raise the brightness of a pulp from its original value is completely irrelevant to the use of a sulphite, in accordance with the invention, to inhibit alkaline darkening which serves to prevent lowering of the original brightness of the pulp.

As indicated above, the principal reference WO 96/20308 is concerned with **bleaching** of filled paper and more especially a paper that has been darkened previously due to calcium carbonate. The bleaching chemical employed in WO 96/20308 does **not** hinder the darkening; rather it functions to remove some of the chromophores produced by the darkening.

This is completely different from the present invention. Modifying the bleaching agent of WO 96/20308 to employ a bleaching agent described by **Eckert** does not result in the invention. Neither reference, alone or in combination, suggests that sulphites inhibit alkaline darkening caused by calcium carbonate filler.

The continued reliance on **Evans et al** is not understood. Evans et al in no way suggests that a sulphite inhibits alkaline darkening caused by calcium carbonate. Evans et al is concerned with the darkening which results from the use of caustic soda in the de-inking of waste paper. Evans et al solved the problem by not using caustic soda for their de-inking. Evans et al replaced the caustic soda (responsible for their alkaline darkening) by a combination of sodium sulphite and sodium carbonate. Thus, Evans et al avoids alkaline darkening by removing the reagent that was producing such darkening, namely, the caustic soda. This has no bearing on the present

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invention. In the present invention, the alkaline darkening is caused by calcium carbonate filler. The calcium carbonate filler is not replaced; rather it is still employed and the darkening effect is overcome by the addition of the sulphite.

With respect, Evans et al is irrelevant.

Furthermore, modifying WO 96/20308 to employ sodium sulphite and sodium carbonate rather than the bleaching agent described in WO 96/20308, does not result in the present invention, and in any event, there is no basis for such replacement, Evans et al being concerned with a problem completely unrelated to the problem in WO 96/20308. As such, there is no motivation to make the substitution.

b) Rejection of Claim 8

The rejection of claim 8 relies on the basic combination of references in the rejection of claims 1 to 7, 10, 11, and 20 to 25.

The teaching of Tsukamoto et al relating to adjustment of pH during **bleaching** does not overcome the deficiency in the basic objection based on WO 96/20308 with Eckert or Evans et al.

None of these references contains any teaching with respect to inhibiting alkaline darkening caused by calcium carbonate, let alone to inhibit such darkening by the use of a sulphite.

c) Rejection of Claim 9

This rejection relies on the principal combination of WO 96/20308 with **Eckert** or **Evans et al**.

Neither Nye nor EP 0 608 687 overcomes the basic deficiencies in the principal combination.

None of the five references is concerned with inhibiting alkaline darkening of mechanical pulp caused by the calcium carbonate filler, let alone inhibiting such darkening by the addition of a sulphite.

d) Rejection of Claim 12

This relies on the basic combination of WO 96/20308 with Eckert or Evans et al.

The so-called ADMITTED PRIOR ART does not overcome the deficiency in the principal combination. The so-called ADMITTED PRIOR ART is not concerned with inhibition of darkening caused by calcium carbonate filler, in a

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mechanical pulp. Indeed, neither the ADMITTED PRIOR ART nor the basic combination of references is concerned with inhibition of alkaline darkening caused by calcium carbonate filler in a mechanical pulp.

e) Rejection of Claims 1 to 8, 10, and 20 to 25

Hovey recognizes that calcium carbonate filler causes alkaline darkening of pulp and indeed this is acknowledged at page 3 of the specification of the present application. The solution proposed by Hovey was to compensate for the alkaline darkening by the addition of higher amounts of calcium carbonate filler so that such higher amounts of the white calcium carbonate would mask or conceal the darkened pulp. This in **no way** represents inhibition of darkening. The darkening still occurs, but is less evident or visible to the eye because of the masking or obstructing effect of the higher loading of the white calcium carbonate filler.

The secondary reference of Tsukamoto et al has no relevance to the teachings of Hovey. Tsukamoto et al is not concerned with pulp suspensions and contains no suggestion anywhere of inhibiting alkaline darkening which arises from the presence of calcium carbonate filler in a pulp.

Tsukamoto et al is **not** concerned with pulp suspensions which typically would have a solid content of not more than 4%. Tsukamoto et al is concerned with a wet wood pulp mass having a solids content of from 20 to 50% which is dried to a consistency of 65 to 95% by weight. During the drying process the wood pulp is sulphonated. The purpose of the sulphonation is to increase the mechanical strength and the brightness of the pulp at low cost. The wet pulp mass of Tsukamoto et al does not contain calcium carbonate filler. There is no suggestion anywhere in Tsukamoto et al of inhibiting alkaline darkening which arises from the presence of calcium carbonate filler in a pulp, by the use of a sulphite. Whatever brightening is being achieved by the sulphonation in the process of Tsukamoto et al is unrelated to inhibition of alkaline darkening caused by calcium carbonate filler and as such Tsukamoto et al can not possibly teach that sulphonating or a sulphonating agent will inhibit the alkaline darkening caused by calcium carbonate filler, in a pulp suspension.

The present invention is concerned with problems in pulp suspensions containing calcium carbonate as filler, namely, the problem of alkaline darkening caused by the calcium carbonate filler. In accordance with the invention, it has been

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found that such alkaline darkening is inhibited by incorporating a sulphite in the pulp suspension.

Tsukamoto et al is not concerned with a pulp suspension, and there is no calcium carbonate present in the process described by Tsukamoto et al. The use of a sulphite according to the teachings of Tsukamoto et al for sulphonating pulp to increase its strength and brightness has nothing to do with alkaline darkening caused by calcium carbonate filler.

f) Rejection of Claim 9

This relies on the basic combination of Hovey and Tsukamoto et al. The tertiary references of Nye and EP 0 608 687 do not overcome the deficiencies of the principal and secondary reference.

There is nothing in the four references which suggests inhibiting alkaline darkening of mechanical pulp as a result of calcium carbonate in any way. Only Hovey is concerned with the problem, but Hovey does not inhibit the darkening. The alkaline darkening still takes place but is concealed or masked by a high loading of calcium carbonate filler so that the darkening is less visible to the eye.

g) Rejection of Claim 12

This relies on the basic combination of Hovey and Tsukamoto et al. The so-called ADMITTED PRIOR ART does not overcome the deficiency of the basic objection. Neither Tsukamoto et al nor the so-called ADMITTED PRIOR ART are concerned with the problem of alkaline darkening. None of the references is concerned with inhibiting the alkaline darkening, let alone inhibiting the darkening by the use of sulphite.

Apart from what appears to be a complete misreading or misunderstanding of the teachings of Hovey and of Evans et al, the rejections raised in the Final Action and throughout the prosecution of this application are based on a lack of appreciation of the difference between inhibiting alkaline darkening of a mechanical pulp caused by calcium carbonate filler, whereby the darkness of the pulp is effectively increased, on the one hand, and the brightening or bleaching of an already darkened pulp, on the other.

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The present invention prevents the additional darkening of the pulp beyond its natural colour. In contrast, the bleaching and brightening of the prior art seeks to overcome the darkening which has already occurred.

As outlined above and previously in the prosecution and demonstrated in the Examples including the additional Examples in Appendix A, bleaching a darkened pulp does not overcome the darkening to produce a brightness at the same level as can be achieved by preventing the darkening in the first place.

One process, namely, that of the present invention, is preventing the darkening from occurring. The other process, bleaching or brightening (as shown in the prior art) is attacking the darkened pulp and seeking to reverse the darkening which has occurred. These two approaches are completely different, and it appears that it is the failure to recognize this difference that has resulted in the lengthy prosecution and reliance on prior art teachings that are irrelevant to the concept of preventing or hindering alkaline darkening of mechanical pulp (caused by calcium carbonate filler), by use of a sulphite.

SPECIFIC POINTS OF NOVELTY IN APPELLANT'S CLAIMS OVER THE CITED PRIOR ART

1. Claim 1

Claim 1 expressly requires inhibiting alkaline darkening of a mechanical pulp in the presence of calcium carbonate filler, by incorporating in a suspension of mechanical pulp, the calcium carbonate filler and a sulphite to inhibit the darkening of the pulp arising from the calcium carbonate filler in the suspension.

2. Claim 2

In addition to the point of novelty set forth in 1), claim 2 recites that the sulphite is in an amount effective in inhibiting alkaline darkening.

3. Claim 3

In addition to the point of novelty set forth in 1), claim 3 expressly recites a pH of at least 6.5 in the suspension.

4. Claim 4

In addition to the points of novelty set forth in 1) and 3), claim 4 recites specific classes of sulphites.

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5. Claim 5

In addition to the points of novelty set forth in 1) and 3), claim 5 recites a specific sulphite.

6. Claims 6 and 7

In addition to the points of novelty set forth in 1) and 4), these claims recite specific pH ranges.

7. Claim 8

In addition to the points of novelty set forth in 1), 5), and 6), this claim requires a pH buffer or an acid to establish the pH.

8. Claim 9

This claim, in addition to the points of novelty set forth in 1), 3), and 5), requires the addition of a chelating agent to the suspension.

9. Claims 10 and 11

These claims, in addition to the point of novelty set forth in 1), recite the points of addition of the sulphite to the suspension.

10. Claim 20

Claim 20 expressly recites a method of inhibiting darkening of a mechanical pulp in the presence of calcium carbonate in which a sulphite is incorporated in the suspension of a mechanical pulp and calcium carbonate filler, a pH of 7 to 9 is maintained in the resulting suspension, and the sulphite is chemically reacted with the pulp to inhibit darkening of the pulp by the calcium carbonate.

11. Claim 21

In addition to the point of novelty set forth in 10), claim 21 recites specific classes of sulphite.

12. Claim 22

In addition to the point of novelty set forth in 10), this claim recites specific sulphites.

13. Claim 23

Claim 23 expressly recites a method of producing paper from a mechanical pulp and calcium carbonate filler in which a sulphite is incorporated in a suspension of the pulp and calcium carbonate filler, a defined pH is maintained in the suspension,

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the sulphite is chemically reacted with the pulp to inhibit the darkening of the pulp by the calcium carbonate filler, and the suspension is formed into paper.

14. Claim 24

This claim, in addition to the points of novelty in 13), recites specific classes of sulphite.

15. Claim 25

This claim, in addition to the points of novelty set forth in 13), recites specific sulphites.

A. Main Distinction

All the claims require the incorporation of both a calcium carbonate filler and a sulphite in an aqueous suspension of a mechanical pulp, and inhibition of the alkaline darkening of the pulp by the sulphite, such darkening arising from the calcium carbonate filler in the suspension.

Independent claim 20 additionally requires maintaining a defined pH range in the suspension and expressly recites chemically reacting the sulphite with the pulp to inhibit the darkening of the pulp by the calcium carbonate.

Independent claim 23 requires the features of claim 20 in a method of producing paper from the mechanical pulp and calcium carbonate filler and additionally includes the forming of the suspension into paper.

The basic feature of inhibiting alkaline darkening of mechanical pulp caused by the calcium carbonate filler is neither taught nor suggested by any of the references. Only one of the references, Hovey, is directed to the problem of alkaline darkening of mechanical pulp caused by calcium carbonate filler, and the solution to the problem proposed by Hovey is completely unrelated to the solution provided by the present invention. Hovey does not even inhibit the darkening. The darkening still occurs in Hovey, but Hovey seeks to mask the darkening so that it is less detectable by the eye, by high loads of calcium carbonate filler, the excess loading of calcium carbonate filler serving to obscure or mask the darkening of the pulp that has occurred. There is no inhibition of the alkaline darkening in Hovey. There is only "hiding" the darkening by an excess of white filler.

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B. Subsidiary Distinctions

The dependent claims further distinguish by reciting preferred sulphites and parameters of the method.

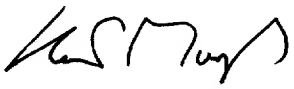
The claims under consideration are believed to fully distinguish over the references in the rejections as set forth in the Final Action. It is submitted that the Examiner has erred in his findings and none of the references in any way suggests or would lead a person in the art to the method of the invention.

APPELLANT BRIEF FEE

The Fee for the Appeal Brief is $160.00, and a cheque in payment of such Fee is submitted herewith.

Should any additional Fee be due, the Commissioner is hereby authorized to charge said Fee to Deposit Account No. 19-5113.

Respectfully,
XUJUN HUA ET AL
By:



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Encs. – Appeal Brief (in triplicate)
Appendix A
Appendix (claims 1-12 & 20-25)
cheque $160.00

Appendix A

Example VII

This example demonstrates the distinction between darkening inhibition effect of sodium sulphite according to this invention, and the brightening effect as known in the prior art.

A TMP was treated with calcium carbonate in the presence and absence of sodium sulphite. In the absence of sulfite, the brightness of the pulp decreased from 57.6 to 54.6% because of alkaline darkening (Table 4). When 1% sulfite was presented during the calcium carbonate treatment, the final brightness was 57.5% because sulfite inhibited alkaline darkening. However, when 1.5% sulfite was used to brighten the alkaline-darkened pulp, the brightness increased only to 55.7% from 54.6%. Clearly, the brightness loss due to alkaline darkening cannot simply be regained by bleaching, even with a higher sulfite dosage in the bleaching stage, 1.5% in this case. The darkening inhibition effect of sulphite in this example was rather unexpected. If sulfite did not inhibit alkaline darkening, and functioned only as a bleaching or brightening agent to eliminate the existing chromophores, then we would expect that when sulfite was used to bleach the darkened pulp, it should have gained more brightness because there were more chromophores there to react. However, our results showed the opposite. Therefore, the function of sulfite according to our invention is darkening inhibition, not bleaching or brightening.

Table 4. TMP brightness under neutral and acid conditions w/o sodium sulphite.

Pretreatment with PCC in the presence and absence of sulphite		Subsequent brightening with sodium sulphite	Handsheets
pH	Na_2SO_3%	Na_2SO_3%	Brightness %
5.3	0	N/A	57.6
7.0	0	N/A	54.6
7.0	1	N/A	57.5
7.0	0	1	55.5
7.0	0	1.5	55.7

Example VIII

This example shows that even though bleaching or brightening process may eliminate some of the chromophores generated by alkaline darkening, a much higher chemical consumption is required to reach a target brightness in comparison to that when the darkening is inhibited according to our invention. In this example, alkaline-darkening caused a brightness drop from 58.2 to 55.7 after bleaching with 0.4% hydrosulphite (Table 5). When the darkening was inhibited with 0.9% sulfite, the pulp brightness increased to 57.2% after the subsequent bleaching stage under the same conditions. In the absence of sulfite, the subsequent bleaching stage required a double amount of hydrosulfite (0.8%) to reach the same brightness target, which is very costly because the bleaching agent is expensive. Please note that when sulphite was used under acidic conditions, pH 5.4 in this case, the brightness gain was much smaller because there was no alkaline darkening. The sulfite used under acidic conditions functioned only as brightening agent. Obviously, the darkening inhibition of sulfite cannot be explained by its brightening effect.

Table 5. The brightness of TMP bleached with hydrosulphite before and after a pre-treatment with sodium sulphite. The pH was adjusted with sodium phosphate.

Pretreatment with PCC in the presence and absence of sulphite, 2 hours, 82°C		Bleaching with hydrosulphite at 3.6% cs., 60°C for 40 min.	Handsheets
pH	Na_2SO_3%	Sodium hydrosulphite %	Brightness %
No any treatment or bleaching			53.9
5.4	0	0.4	58.2
5.4	0.9	0.4	58.7
7.0	0	0.4	55.7
7.0	0.9	0.4	57.2
7.0	0	0.8	57.2
7.0	0	1.2	57.7

APPENDIX CONTAINING CLAIMS 1-12 AND 20-25

1. A method of inhibiting alkaline darkening of a mechanical pulp in the presence of a calcium carbonate filler comprising:

providing an aqueous suspension of a mechanical pulp for producing paper, and

incorporating in said suspension a calcium carbonate filler for producing paper with the pulp, and a sulphite to inhibit alkaline darkening of said pulp in said suspension arising from the calcium carbonate filler in the suspension.

2. A method according to claim 1, wherein said sulphite is in an amount effective for inhibiting alkaline darkening.

3. A method according to claim 1, wherein a pH of at least 6.5 is established in the aqueous suspension of said pulp, containing the calcium carbonate filler and sulphite.

4. A method according to claim 3, wherein said sulphite is selected from alkali metal sulphites, alkali metal bisulphites and alkali metal metabisulphites.

5. A method according to claim 4, wherein said sulphite is selected from sodium sulphite, sodium bisulphite and sodium metabisulphite.

6. A method according to claim 5, wherein said pH is 6.5 to 9.

7. A method according to claim 6, wherein said pH is 7 to 9.

8. A method according to claim 6, wherein the pH is established by addition of a pH buffer or an acid.

9. A method according to claim 6, further including adding in chelating agent to the suspension.

10. A method according to claim 1, wherein said sulphite is incorporated in said suspension prior to incorporation of the calcium carbonate filler.

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11. A method according to claim 1, wherein said sulphite is incorporated together with said calcium carbonate filler in said suspension.

12. A method according to claim 1, wherein the sulphite is incorporated in the suspension by addition at a latency chest, storage tank or machine chest during processing of the aqueous suspension to form paper.

20. A method of inhibiting darkening of a mechanical pulp in the presence of calcium carbonate comprising:

providing an aqueous suspension of a mechanical pulp for producing paper,

incorporating in said suspension a calcium carbonate filler for producing paper with the pulp and a sulphite,

maintaining a pH of 7 to 9 in the resulting suspension containing said pulp, filler and sulphite, and

chemically reacting said sulphite with said pulp to inhibit darkening of said pulp by said calcium carbonate.

21. A method according to claim 20, wherein said sulphite is selected from alkali metal sulphites, alkali metal bisulphites and alkali metal metabisulphites.

22. A method according to claim 20, wherein said sulphite is selected from sodium sulphite, sodium bisulphite and sodium metabisulphite.

23. A method of producing paper from a mechanical pulp and calcium carbonate filler comprising:

providing an aqueous suspension of a mechanical pulp for producing paper,

incorporating in said suspension a calcium carbonate filler for producing paper with the pulp, and a sulphite,

maintaining a pH of 6.5 to 9 in the resulting suspension containing said pulp, filler and sulphite,

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chemically reacting said sulphite with said pulp to inhibit darkening of said pulp by said calcium carbonate filler, and

forming said suspension into paper.

24. A method according to claim 23, wherein said sulphite is selected from alkali metal sulphites, alkali metal bisulphites and alkali metal metabisulphite.

25. A method according to claim 23, wherein said sulphite is selected from sodium sulphite, sodium bisulphite and sodium metabisulphite.